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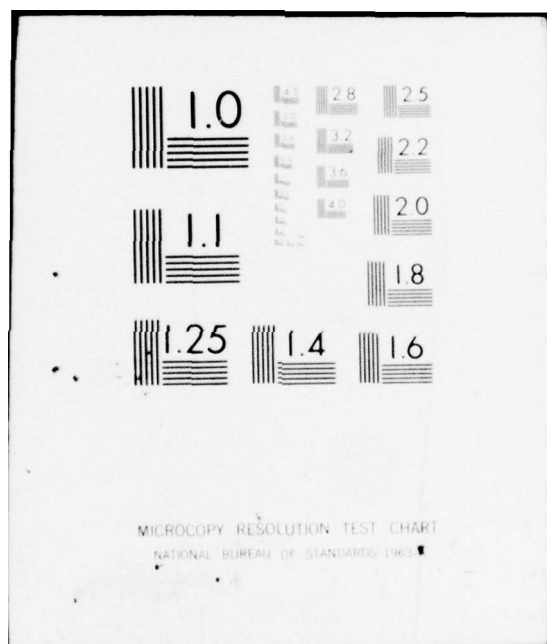
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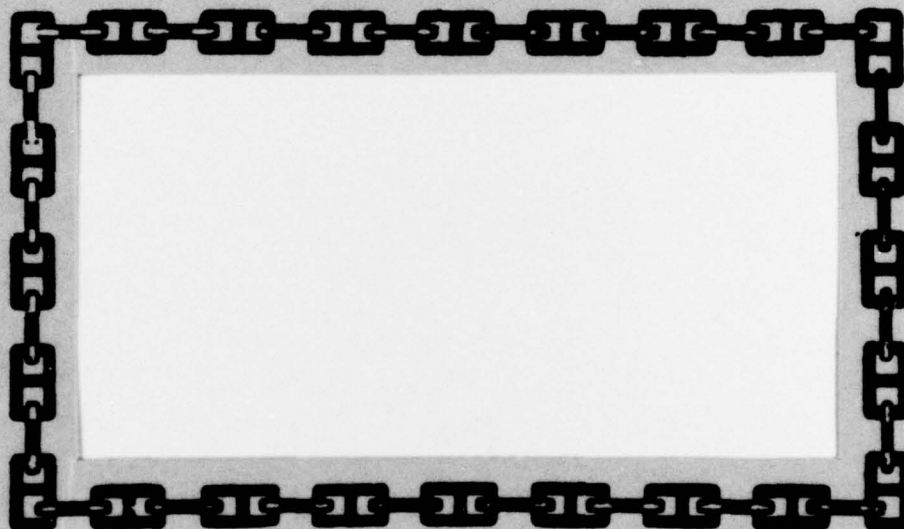
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DEPARTMENT OF THE NAVY
NAVY EXPERIMENTAL DIVING UNIT
Panama City, Florida 32401

NAVY EXPERIMENTAL DIVING UNIT
REPORT 3-75

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OF THE DM-5 BANDMASK.
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ABSTRACT

The General Aquadyne Corporation submitted its DM-5 Bandmask to the Navy Experimental Diving Unit for test and evaluation in July 1975. This Bandmask was developed as an integral part of an underwater television system.

Inasmuch as DM-5 Bandmask performance did not meet the requirements of MIL-R-24169A, it was not recommended for Navy Approval.

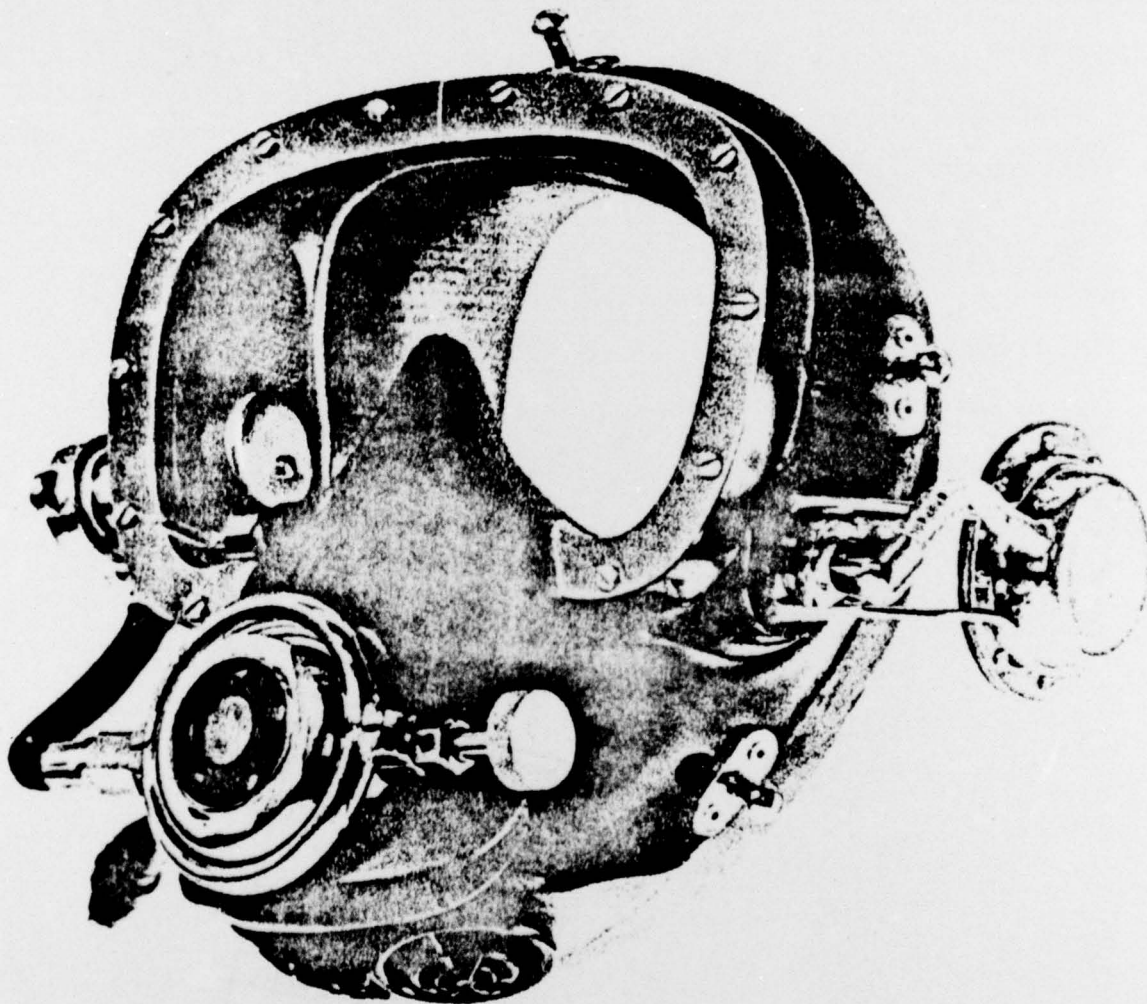
After some modification to the DM-5, it was submitted for reevaluation in November 1975. Performance again failed to meet specification requirements; therefore, the modified model DM-5 is not recommended for Navy Approval.

With further vendor modification, the DM-5 could probably be made to perform to specification requirements and further testing could then be recommended.

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MODEL DM-5

INTRODUCTION

The General Aquadyne Corporation submitted a DM-5 Bandmask to the Navy Experimental Diving Unit (NEDU) for test and evaluation, and if merited, service approval. The bandmask was to be used as an integral component of an underwater television system developed by Aquadyne. The DM-5 Bandmask was first submitted for test and evaluation in July 1975. Because bandmask performance was unsatisfactory, Aquadyne modified it and then submitted it for reevaluation in November 1975.

The DM-5 Bandmask is basically a demand regulator that operates on the same principles as the second stage of a single-hose regulator. Tests on both models, therefore, were conducted in accordance with MIL-R-24169A requirements for single-hose regulators.

TEST EQUIPMENT

Tests of both the original DM-5 Bandmask and the modified model were conducted at NEDU and required the use of the following test equipment.

- a. Respiratory simulator
- b. Validyne pressure transducer DP-15
- c. Validyne transducer indicator CD-12
- d. MFE x-y plotter 715M.

The original model DM-5 was tested at NEDU Ocean Simulation Facility in Chamber C and the modified model in Chamber D.

TEST PROCEDURE

The equipment for the two tests was arranged as shown in Figure 1. The tests were performed at depths from 0 to 199 feet of sea water (fsw) in 33-foot increments (see Appendix A). Supply pressure was set at 60, 120, and 180 psig above ambient bottom pressure. At each setting, the respiratory minute volume (RMV) was varied from 40 to 70 liters per minute (lpm). The entire test arrangement was underwater within the NEDU chamber.

Differential pressure was sensed by a Validyne DP-15 transducer. The transducer signal was conditioned by a Validyne CD-12 transducer indicator. All recording was accomplished with an MFE 715M x-y plotter.

RESULTS

GENERAL

The DM-5 test data were evaluated for conformance to the requirements of MIL-R-24169A. However, because of the DM-5 manufacturer's specifications, a less demanding limit of 20 cm H₂O of inhalation resistance was used in place of the graduated 5 to 20 cm specified.

TEST OF ORIGINAL DM-5

Test results are shown graphically in Figure 2.

As shown, the measured exhalation resistance levels were acceptable at all depths and at all supply pressures.

At 60-psig supply pressure, the measured inhalation pressure levels were not acceptable at any depth. At 120- and 180-psig supply pressures, the inhalation pressures were unacceptable beyond 99 fsw.

TEST OF MODIFIED DM-5

Figure 3 is a graphic presentation of the results of the modified DM-5 test. As shown by the figure, the measured exhalation pressure did not conform to specification except at 99 and 166 fsw with a supply pressure of 180 psig and at 99 and 132 fsw with 120-psig supply pressure.

The measured inhalation resistance levels were unacceptable at all depths.

CONCLUSIONS AND RECOMMENDATIONS

For a bandmask to be considered acceptable for service use, it must perform in accordance with MIL-R-24169A (with the exception noted in "RESULTS, GENERAL") to a depth of 199 fsw. Because the DM-5 Bandmask in either the original or the modified configuration did not perform satisfactorily at any depth, it is not recommended for service approval. Possibly, with further vendor modification, the DM-5 would perform well enough for approval. If General Aquadyne Corporation makes these modifications, further testing could be considered.

That "Service Approval" does not mean "Service Acceptance" is emphasized. The USN Bandmask was specifically developed for the role for which the DM-5 was tested and will presently remain the USN primary equipment.

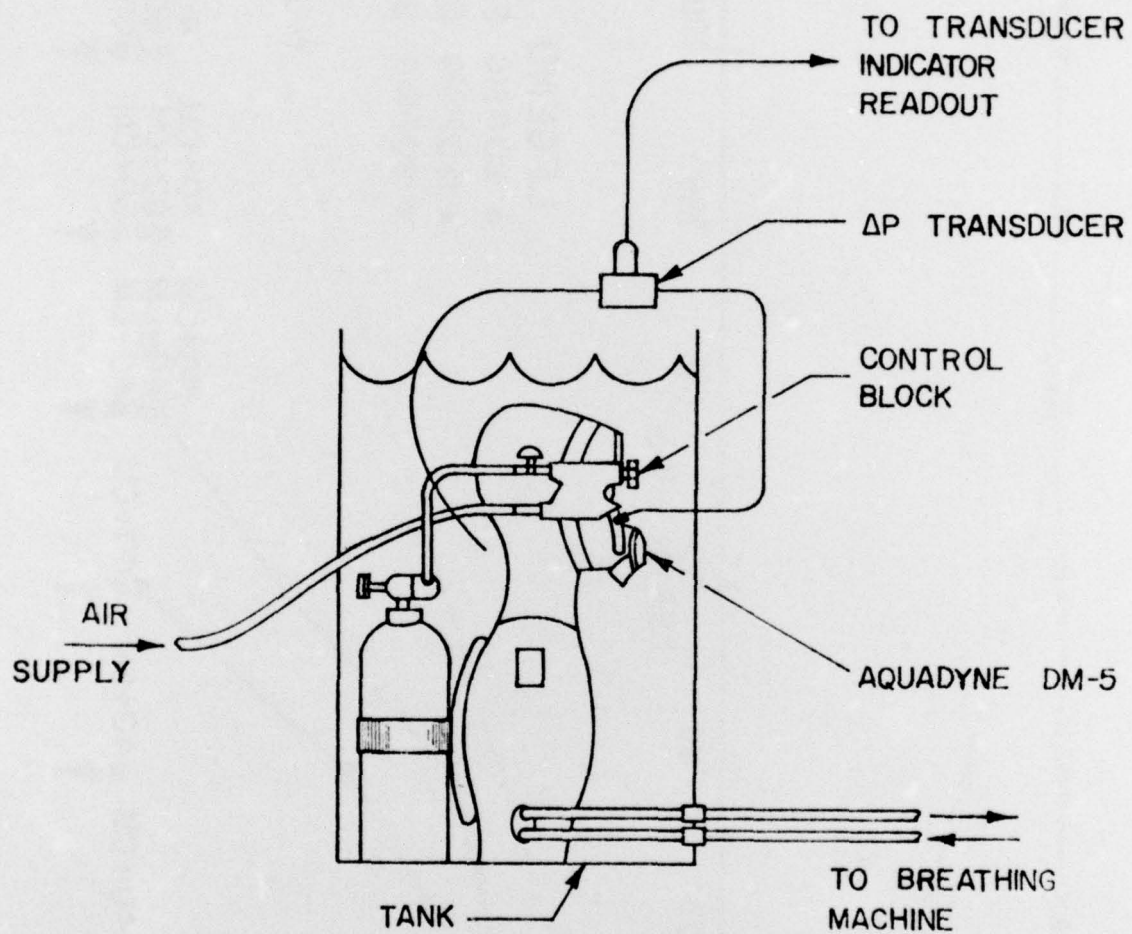


FIGURE 1. BANDMASK EQUIPMENT ARRANGEMENT

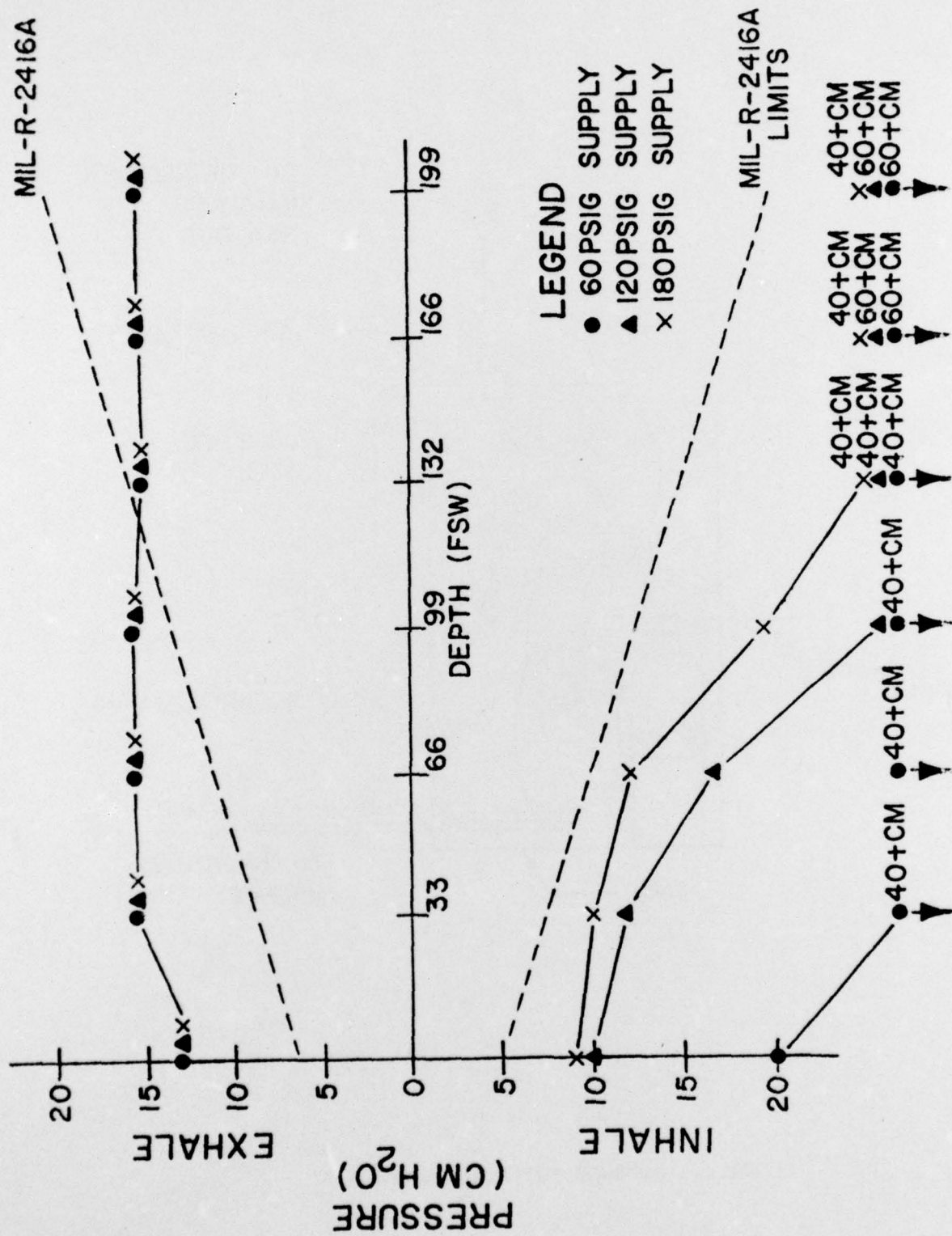


FIGURE 2. PLOT OF BREATHING RESISTANCE VS. DEPTH FOR DM-5 BANDMASK

APPENDIX A

TEST PROTOCOL

APPENDIX A
TEST PROTOCOL

A. OBJECTIVE

The objective of the test of the Aquadyne DM-5 Bandmask by the Navy Experimental Diving Unit is to compare test results with results obtained of the unmanned tests of the prototype USN MK 1 MOD 0, particularly the side valve. The tests will include breathing work and supply pressure requirements at several breathing rates.

B. PROCEDURE

Set up apparatus as shown in figure 1. At depths ranging from 0 - 190 fsw in 33-foot increments, the following will be performed:

1. Set supply pressure at 60 psig over bottom
2. Set respiratory rate at 20 bpm
3. Run breathing machine
4. After 2 minutes, record x-y plot
5. Set supply pressure at 120 psig over bottom
6. Repeat steps 2, 3, and 4
7. Set supply pressure at 180 psig over bottom
8. Repeat steps 2, 3, and 4

C. EQUIPMENT TO BE USED

1. NEDU complexes C and D
2. Gould 200 x-y plotter
3. Validyne pressure transducer
4. Validyne transducer indicator CD-12
5. Roylyn pressure gauge, 0 - 250 psig
6. Respiratory simulator
7. Bourns linear potentiometer

D. PARAMETERS TO BE CONTROLLED

1. Depth
2. Supply pressure
3. RMV

E. PARAMETERS TO BE MEASURED

1. Inhalation pressure (Differential Pressure)
2. Exhalation pressure

F. PARAMETERS TO BE COMPUTED

Respiratory work

G. DATA TO BE PLOTTED

1. Differential pressure vs. volume
2. Tidal volume

H. CONCLUSIONS

1. Maximum respiratory work level at minimum supply pressure

I. SAMPLE DATA SHEET

See figure A1.

DEPTH (FSW)	DEPTH (PSIG)	SUPPLY PRESSURE (PSIG O.B.)	SUPPLY PRESSURE (PSIG)	RMV BPM
0	0	60	60	40/20
0	0	60	60	50/25
0	0	60	60	60/30
0	0	60	60	70/35
0	0	120	120	40/20
0	0	120	120	50/25
0	0	120	120	60/30
0	0	120	120	70/35
0	0	180	180	40/20
0	0	180	180	50/25
0	0	180	180	60/30
0	0	180	180	70/35
33	15	60	75	40/20
33	15	60	75	50/25
33	15	60	75	60/20
33	15	60	75	70/35

FIGURE A1. SAMPLE DATA SHEET

